

IN THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A broad-band plate antenna in which a single linear element portion and a slot element portion are integrally formed; wherein
a one-end-open non-conductive surface $[(25)]$ is provided in a conductive substrate $[(10)]$ in parallel to a part of an outer perimeter of the conductive substrate, so as to form a linear element portion $[(22)]$ between the part of the outer perimeter and the one-end-open non-conductive surface,
a closed rectangle shaped non-conductive surface is provided in the conductive substrate in parallel to said one-end-open non-conductive surface, so as to form a slot element portion $[(24)]$,
a non-conductive portion $[(28)]$ is provided in a feeding point forming conductive portion $[(23)]$ formed between the one-end-open non-conductive surface and the slot element portion, so as to use opposing ends of said non-conductive portion as a feeding point $[(14)]$,
and
remaining conductive portion of the conductive substrate other than said linear element portion, said slot element portion, and said feeding point forming conductive portion is used as a groundplate portion $[(21)]$.
2. (Currently Amended) A broad-band plate antenna in which a single linear element portion and a slot element portion are integrally formed; wherein
a one-end-open gap portion $[(25)]$ is provided in a conductive substrate $[(10)]$ in parallel to a part of an outer perimeter of the conductive substrate, so as to form a linear element portion $[(22)]$ between the part of the outer perimeter and the one-end-open gap portion,
a slot is provided in the conductive substrate in parallel to said one-end-open gap portion, so as to form a slot element portion $[(24)]$,

an opening portion [(28)] is provided in a feeding point forming conductor portion [(23)] formed between the one-end-open gap portion and the slot element portion, so as to use opposing ends of the opening portion as a feeding point [(14)], and

remaining conductive substrate other than said linear element portion, said slot element portion, and said feeding point forming conductor portion is used as a groundplate portion [(21)].

3. (Currently Amended) A broad-band plate antenna in which a plurality of linear element portions and a slot element portion are integrally formed; wherein

a first one-end-open non-conductive surface [(25a)] is provided in a conductive substrate [(10)] in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion [(22a)] between the part of the outer perimeter and the first one-end-open non-conductive surface,

a second one-end-open non-conductive surface [(25b)] is provided in the conductive substrate in parallel to said first one-end-open non-conductive surface, so as to form a second linear element portion [(22b)] between said second one-end-open non-conductive surface and the first one-end-open non-conductive surface,

a closed rectangle shaped non-conductive surface is provided in the conductive substrate in parallel to said second one-end-open non-conductive surface, so as to form a slot element portion [(24)],

a non-conductive portion [(28)] is provided in a feeding point forming conductive portion [(23)] formed between the second linear element portion and the slot element portion, so as to use opposing ends of said non-conductive portion as a feeding point [(14)], and

remaining conductive substrate other than said plurality of linear element portions, said slot element portion, and said feeding point forming conductive portion is used as a groundplate portion [(21)].

4. (Currently Amended) A broad-band plate antenna in which a plurality of linear element portions and a slot element portion are integrally formed; wherein

a first one-end-open gap portion [(25a)] is provided in a conductive substrate [(10)] in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear

element portion [(22a)] between the part of the outer perimeter and the first one-end-open gap portion,

a second one-end-open gap portion [(25b)] is provided in the conductive substrate in parallel to said first one-end-open gap portion, so as to form a second linear element portion [(22b)] between said second one-end-open gap portion and the first one-end-open gap portion,

a slot is provided in the conductive substrate in parallel to said second one-end-open gap portion, so as to form a slot element portion [(24)],

an opening portion [(28)] is provided in a feeding point forming conductor portion [(23)] formed between the second linear element portion and the slot element portion, so as to use opposing ends of said opening portion as a feeding point [(14)], and

remaining conductive substrate other than said plurality of linear element portions, said slot element portion, and said feeding point forming conductor portion is used as a groundplate portion [(21)].

5. (Currently Amended) A broad-band plate antenna in which a plurality of linear element portions and a slot element portion are integrally formed; wherein

a first one-end-open non-conductive surface [(25a)] is provided in a conductive substrate [(10)] in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion [(22a)] between the part of the outer perimeter and the first one-end-open non-conductive surface,

a plurality of one-end-open non-conductive surfaces consisting of a second one-end-open non-conductive surface [(25b)] to an Nth one-end-open non-conductive surface [(25n)] are provided in the conductive substrate in parallel to said first one-end-open non-conductive surface, so as to form a plurality of linear element portions consisting of a second linear element portion [(22b)] to an Nth linear element portion [(22n)] between said one-end-open non-conductive surfaces,

a closed rectangle shaped non-conductive surface is provided in the conductive substrate in parallel to said Nth one-end-open non-conductive surface, so as to form a slot element portion [(24)],

a non-conductive portion [(28)] is provided in a feeding point forming conductive portion [(23)] formed between the Nth one-end-open non-conductive surface and the slot

element portion, so as to use opposing ends of said non-conductive portion as a feeding point [(14)], and

remaining conductive substrate other than said plurality of linear element portions, said slot element portion, and said feeding point forming conductive portion is used as a groundplate portion [(21)].

6. (Currently Amended) A broad-band plate antenna in which a plurality of linear element portions and a slot element portion are integrally formed; wherein

a first one-end-open non-conductive surface [(25a)] is provided in a conductive substrate [(10)] in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion [(30a)] of which length on an outer peripheral side of the conductive substrate is shorter, between the part of the outer perimeter and the first one-end-open non-conductive surface,

a second one-end-open non-conductive surface [(25b)] is provided in the conductive substrate in parallel to said first one-end-open non-conductive surface, so as to form a second linear element portion [(30b)] having a length longer than the first linear element portion between said second one-end-open non-conductive surface and the first one-end-open non-conductive surface,

a closed rectangle shaped non-conductive surface is provided in the conductive substrate in parallel to said second one-end-open non-conductive surface, so as to form a slot element portion [(24)],

a non-conductive portion [(28)] is provided in a feeding point forming conductive portion [(23)] formed between the second linear element portion and the slot element portion, so as to use opposing ends of said non-conductive portion as a feeding point [(14)],

the first linear element portion and a feeding point forming conductor portion are connected to each other by a first conductor portion [(31)], and

remaining conductive substrate other than said plurality of linear element portions, said slot element portion, and said feeding point forming conductive portion is used as a groundplate portion [(21)].

7. (Currently Amended) A broad-band plate antenna in which a plurality of linear element portions and a slot element portion are integrally formed; wherein

a first one-end-open gap portion [(25a)] is provided in a conductive substrate [(10)] in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion [(30a)] between the part of the outer perimeter and the first one-end-open gap portion,

a second one-end-open gap portion [(25b)] is provided in the conductive substrate in parallel to said first one-end-open gap portion, so as to form a second linear element portion [(30b)] having a length longer than the first linear element portion between said second one-end-open gap portion and the first one-end-open gap portion,

a slot is provided in the conductive substrate in parallel to said second one-end-open gap portion, so as to form a slot element portion [(24)],

an opening portion [(28)] is provided in a feeding point forming conductor portion [(23)] formed between the second linear element portion and the slot element portion, so as to use opposing ends of said opening portion as a feeding point [(14)],

the first linear element portion and the feeding point forming conductor portion are connected to each other by a first conductor portion [(31)], and

remaining conductive substrate other than said plurality of linear element portions, said slot element portion, and said feeding point forming conductor portion is used as a groundplate portion [(21)].

8. (Currently Amended) A broad-band plate antenna in which a plurality of linear element portions and a slot element portion are integrally formed; wherein

a first one-end-open non-conductive surface [(25a)] is provided in a conductive substrate [(10)] in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion [(30a)] between the part of the outer perimeter and the first one-end-open non-conductive surface,

a plurality of one-end-open non-conductive surfaces consisting of a second one-end-open non-conductive surface [(25b)] to an Nth one-end-open non-conductive surface [(25n)] are provided in the conductive substrate in parallel to said first one-end-open non-conductive surface, so as to form a plurality of linear element portions consisting of a second linear element

portion [(30b)] to an Nth linear element portion [(30n)], having a length longer than the first linear element portion, between said one-end-open non-conductive surfaces,

a closed rectangle shaped non-conductive surface is provided in the conductive substrate in parallel to said Nth one-end-open non-conductive surface, so as to form a slot element portion [(24)],

a non-conductive portion [(28)] is provided in a feeding point forming conductive portion [(23)] formed between the Nth one-end-open non-conductive surface and the slot element portion, so as to use opposing ends of said non-conductive portion as a feeding point [(14)],

the first linear element portion and a feeding point forming conductor portion are connected to each other by a first conductor portion [(31)], and

remaining conductive substrate other than said plurality of linear element portions, said slot element portion, and said feeding point forming conductive portion is used as a groundplate portion [(21)].

9. (Currently Amended) A broad-band plate antenna including a conductive substrate [(10)] forming a composite element portion and a groundplate portion [(21)]; wherein

a first one-end-open non-conductive surface [(25a)] is provided in the conductive substrate in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion [(30a)] between the part of the outer perimeter and the first one-end-open non-conductive surface,

a second one-end-open non-conductive surface [(25b)] is provided in the conductive substrate in parallel to said first one-end-open non-conductive surface, so as to form a second linear element portion [(30b)] having a length longer than the first linear element portion between said second one-end-open non-conductive surface and the first one-end-open non-conductive surface,

a third one-end-open non-conductive surface [(25c)] is provided in the conductive substrate in parallel to said second one-end-open non-conductive surface, so as to form a third linear element portion [(30c)] having a length shorter than the second linear element portion between said third one-end-open non-conductive surface and the second one-end-open non-

conductive surface, and an area of a non-conductive portion between the second linear element portion and the groundplate portion is made larger,

a conductive portion commonly short-circuiting each element to the groundplate portion is identified as each-element-groundplate commonly short-circuiting conductive portion [(26)],

one feeding point [(14a)] is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the second linear element portion,

the other feeding point [(14b)] is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the third linear element portion, and

the first linear element portion and the third linear element portion are connected to each other by a first conductor portion [(31)].

10. (Currently Amended) A broad-band plate antenna including a conductive substrate [(10)] forming a composite element portion and a groundplate portion [(21)]; wherein

a first one-end-open gap portion [(25a)] is provided in the conductive substrate in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion [(30a)] between the part of the outer perimeter and the first one-end-open gap portion,

a second one-end-open gap portion [(25b)] is provided in the conductive substrate in parallel to said first one-end-open gap portion, so as to form a second linear element portion [(30b)] having a length longer than the first linear element portion between said second one-end-open gap portion and the first one-end-open gap portion,

a third one-end-open gap portion [(25c)] is provided in the conductive substrate in parallel to said second one-end-open gap portion, so as to form a third linear element portion [(30c)] having a length shorter than the second linear element portion between said third one-end-open gap portion and the second one-end-open gap portion, and an area of a gap portion between the second linear element portion and the groundplate portion is made larger,

a conductive portion commonly short-circuiting each element to the groundplate portion is identified as each-element-groundplate commonly short-circuiting conductive portion [(26)],

one feeding point [(14a)] is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the second linear element portion,

the other feeding point [(14b)] is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the third linear element portion, and

the first linear element portion and the third linear element portion are connected to each other by a first conductor portion [(31)].

11. (Currently Amended) A broad-band plate antenna including a conductive substrate [(10)] forming a composite element portion and a groundplate portion [(21)]; wherein

a first one-end-open non-conductive surface [(25a)] is provided in the conductive substrate in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion [(30a)] between the part of the outer perimeter and the first one-end-open non-conductive surface,

a second one-end-open non-conductive surface [(25b)] is provided in the conductive substrate in parallel to said first one-end-open non-conductive surface, so as to form a second linear element portion [(30b)] having a length longer than the first linear element portion and an area made larger in a direction of the first linear element portion between said second one-end-open non-conductive surface and the first one-end-open non-conductive surface,

a third one-end-open non-conductive surface [(25c)] is provided in the conductive substrate in parallel to said second one-end-open non-conductive surface, so as to form a third linear element portion [(30c)] having a length shorter than the second linear element portion between said third one-end-open non-conductive surface and the second one-end-open non-conductive surface, and an area of a non-conductive portion between the second linear element portion and the groundplate portion is made larger,

a conductive portion commonly short-circuiting each element to the groundplate portion is identified as each-element-groundplate commonly short-circuiting conductive portion [(26)],

one feeding point [(14a)] is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the second linear element portion,

the other feeding point [(14b)] is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the third linear element portion, and

the first linear element portion and the third linear element portion are connected to each other by a first conductor portion [(31)].

12. (Currently Amended) A broad-band plate antenna including a conductive substrate [(10)] forming a composite element portion and a groundplate portion [(21)]; wherein

a first one-end-open gap portion [(25a)] is provided in the conductive substrate in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion [(30a)] between the part of the outer perimeter and the first one-end-open gap portion,

a second one-end-open gap portion [(25b)] is provided in the conductive substrate in parallel to said first one-end-open gap portion, so as to form a second linear element portion [(30b)] having a length longer than the first linear element portion and an area made larger in a direction of the first linear element portion between said second one-end-open gap portion and the first one-end-open gap portion,

a third one-end-open gap portion is provided in the conductive substrate in parallel to said second one-end-open gap portion, so as to form a third linear element portion [(30c)] having a length shorter than the second linear element portion between said third one-end-open gap portion and the second one-end-open gap portion, and an area of a gap portion between the second linear element portion and the groundplate portion is made larger,

a conductive portion commonly short-circuiting each element to the groundplate portion is identified as each-element-groundplate commonly short-circuiting conductive portion [(26)],

one feeding point [(14a)] is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the second linear element portion,

the other feeding point [(14b)] is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the third linear element portion, and

the first linear element portion and the third linear element portion are connected to each other by a first conductor portion [(31)].

13. (Currently Amended) A broad-band plate antenna including a conductive substrate [(10)] forming a composite element portion and a groundplate portion [(21)]; wherein

a first one-end-open non-conductive surface [(25a)] is provided in the conductive substrate in parallel to a part of an outer perimeter of the conductive substrate, so as to form a

first linear element portion [(30a)] between the part of the outer perimeter and the first one-end-open non-conductive surface,

a second one-end-open non-conductive surface [(25b)] is provided in the conductive substrate in parallel to said first one-end-open non-conductive surface, so as to form a second linear element portion [(30b)] having a length longer than the first linear element portion and an area made larger in a direction of the first linear element portion and in a direction opposite to the first linear element portion between said second one-end-open non-conductive surface and the first one-end-open non-conductive surface,

a third one-end-open non-conductive surface [(25c)] is provided in the conductive substrate in parallel to said second one-end-open non-conductive surface, so as to form a third linear element portion [(30c)] having a length shorter than the second linear element portion between said third one-end-open non-conductive surface and the second one-end-open non-conductive surface, an area of a non-conductive portion between the second linear element portion and the groundplate portion is made larger, and a conductive portion commonly short-circuiting each element to the groundplate portion is identified as each-element-groundplate commonly short-circuiting conductive portion [(26)],

one feeding point [(14a)] is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the second linear element portion,

the other feeding point [(14b)] is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the third linear element portion, and

the first linear element portion and the third linear element portion are connected to each other by a first conductor portion [(31)].

14. (Currently Amended) A broad-band plate antenna including a conductive substrate [(10)] forming a composite element portion and a groundplate portion [(21)]; wherein

a first one-end-open gap portion [(25a)] is provided in the conductive substrate in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion [(30a)] between the part of the outer perimeter and the first one-end-open gap portion,

a second one-end-open gap portion [(25b)] is provided in the conductive substrate in parallel to said first one-end-open gap portion, so as to form a second linear element portion [(20b)] having a length longer than the first linear element portion and an area made larger in a direction of the first linear element portion and in a direction opposite to the first linear element portion between said second one-end-open gap portion and the first one-end-open gap portion,

a third one-end-open gap portion [(25c)] is provided in the conductive substrate in parallel to said second one-end-open non-conductive surface, so as to form a third linear element portion [(30c)] having a length shorter than the second linear element portion between said third one-end-open gap portion and the second one-end-open gap portion, and an area of a gap portion between the second linear element portion and the groundplate portion is made larger,

a conductive portion commonly short-circuiting each element to the groundplate portion is identified as each-element-groundplate commonly short-circuiting conductive portion [(26)],

one feeding point [(14a)] is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the second linear element portion,

the other feeding point [(14b)] is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the third linear element portion, and

the first linear element portion and the third linear element portion are connected to each other by a first conductor portion [(31)].

15. (Currently Amended) A broad-band plate antenna including a conductive substrate [(10)] forming a composite element portion and a groundplate portion [(21)]; wherein

a first one-end-open non-conductive surface [(25a)] is provided in the conductive substrate in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion [(30a)] between the part of the outer perimeter and the first one-end-open non-conductive surface,

a second one-end-open non-conductive surface [(25b)] to an Nth one-end-open non-conductive surface [(25n)] are provided in the conductive substrate in parallel to said first one-end-open non-conductive surface, so as to form a second linear element portion to an Nth linear element portion [(30n)] between said second one-end-open non-conductive surface and the Nth one-end-open non-conductive surface, an (N-1)th linear element portion [(30n-1)] second

closest to the groundplate portion has a length longer than an $(N-2)$ th linear element portion $[(30n-2)]$ third closest to the groundplate portion and an N th linear element portion $[(30n)]$ closest to the groundplate portion, an area of the $(N-1)$ th linear element portion is made larger in a direction of the $(N-2)$ th linear element portion or in a direction of the N th linear element portion or in the direction of the $(N-2)$ th linear element portion and the direction of the N th linear element portion, and an area of a non-conductive portion between the $(N-1)$ th linear element portion and the groundplate portion is made larger,

a conductive portion commonly short-circuiting each element to the groundplate portion is identified as each-element-groundplate commonly short-circuiting conductive portion $[(26)]$,

one feeding point $[(14a)]$ is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the $(N-1)$ th linear element portion,

the other feeding point $[(14b)]$ is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the N th linear element portion, and

an area in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the $(N-2)$ th linear element portion and an area in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the N th linear element portion are connected to each other by a first conductor portion $[(31)]$.

16. (Currently Amended) A broad-band plate antenna including a conductive substrate $[(10)]$ forming a composite element portion and a groundplate portion $[(21)]$; wherein

a first one-end-open gap portion $[(25a)]$ is provided in the conductive substrate in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion $[(30a)]$ between the part of the outer perimeter and the first one-end-open gap portion,

a second one-end-open gap portion $[(25b)]$ to an N th one-end-open gap portion $[(25n)]$ are provided in the conductive substrate in parallel to said first one-end-open gap portion, so as to form a second linear element portion $[(30b)]$ to an N th linear element portion $[(30n)]$ between said second one-end-open gap portion and the N th one-end-open gap portion, an $(N-1)$ th linear element portion $[(30n-1)]$ second closest to the groundplate portion has a length longer than an $(N-2)$ th linear element portion $[(30n-2)]$ third closest to the groundplate

portion, and an Nth linear element portion closest to the groundplate portion, an area of the (N-1)th linear element portion is made larger in a direction of the (N-2)th linear element portion or in a direction of the Nth linear element portion or in the direction of the (N-2)th linear element portion and the direction of the Nth linear element portion, and an area of a gap portion between the (N-1)th linear element portion and the groundplate portion is made larger,

a conductive portion commonly short-circuiting each element to the groundplate portion is identified as each-element-groundplate commonly short-circuiting conductive portion [(26)],

one feeding point [(14a)] is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the (N-1)th linear element portion,

the other feeding point [(14b)] is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the Nth linear element portion, and

an area in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the (N-2)th linear element portion and an area in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the Nth linear element portion are connected to each other by a first conductor portion [(31)].

Claims 17 – 19 (Cancelled)